Chocolate drink prepared using an espresso-type machine, and means of producing same

The present invention relates to a chocolate drink prepared using an espresso-type coffee machine operating with pre-packaged doses. Its subject is also the means for its production, and more particularly concentrates allowing its preparation and capsules containing such concentrates.

A chocolate drink of this type has been envisaged in Application EP 1 190 959. This application relates to cartridges intended to be used with espresso-type coffee machines. More particularly, this application describes a closed cartridge, intended for extraction under pressure, containing a substance for the preparation of a drink chosen from roasted and ground coffee, tea, soluble coffee, a mixture of ground coffee and soluble coffee, a chocolate product or any other dehydrated edible substance.

The expression "espresso-type coffee machine operating with doses" is understood to mean any machine as designed to carry out percolation under pressure of individual doses of coffee. In the present application, when reference will be made to a coffee machine, this will be a machine of the type described above.

The coffee machines envisaged are intended for percolation. In the present application, the aim is to divert the percolation function to a solubilization function in order to prepare a chocolate drink. The creation of a chocolate concentrate capable of being solubilized by the coffee machine makes it possible to make the latter versatile, it then being possible for the same machine to prepare both coffee and chocolate.

The expression "concentrate" is understood to mean a cocoa extract having the characteristics of a chocolate drink which is at least partially dehydrated.

In the entire application, reference will be made without distinction to the terms: "capsule", "dose" and "cartridge". These three terms will be considered as equivalent, although the terms "capsule" and "cartridge" relate more specifically to a packaging.

The work by the inventors led them to observe that a conventional chocolate powder (for example a commercial cocoa powder), present in a capsule and solubilized by an espresso-type coffee machine, did not make it possible to obtain a satisfactory chocolate drink in terms of taste. Indeed, the chocolate drink obtained contains a fairly low amount of cocoa. This low cocoa content is essentially due to the low solubility of the cocoa contained in the capsule (see Example 2).

The present invention therefore provides a chocolate drink containing at least 2% of cocoa prepared using a coffee machine as designed to operate by percolation under pressure of a coffee dose packaged in a capsule, said capsule containing a concentrate of the chocolate drink.

The chocolate drink according to the invention advantageously contains at least 2.30% of cocoa, preferably at least 2.40%.

The good cocoa content is mainly obtained by virtue of the complete solubilization of the concentrate during the passage of the water under pressure. In the espresso-type machines, this passage time is very short, of the order of a few seconds.

More specifically, the solubility of the concentrate is

such that it is completely solubilized by the passage of a maximum of 90 g of water, said water being at a temperature of 60 to 70°C and at a maximum pressure of 6×10^5 Pa, said concentrate having a percentage of dry matter of 60 to 90%, inclusive.

This high percentage of dry matter makes it possible to obtain a drink having, in addition to a strong cocoa taste, body and smoothness. This percentage of dry matter is obtained, inter alia, by virtue of the combination of the cocoa powder with the taste enhancer.

The passage times of the water under pressure in the coffee machines vary between 25 and 40 s on average, excluding the time for the rise in pressure. The solubilization of the concentrate should therefore be carried out during this passage time of the water. Preferably, the solubilization will be carried out during a time of 30 to 35 s.

Other physicochemical properties are capable of influencing the cocoa content of the chocolate drink obtained. Preferably, the concentrate has a density of 1.15 to 1.45, inclusive. More particularly, the concentrate is in liquid form. Its viscosity may also be controlled in order to preserve its good solubility. Advantageously, this viscosity may be from 1300 to 2900 mPa/s, inclusive.

In order to increase the solubility of the concentrate, the inventors developed a cocoa taste enhancer. This cocoa taste enhancer is not only very soluble in water but also offers advantages from the taste point of view.

The cocoa taste enhancer is obtained by a process comprising the following stages:

- extraction of commercial cocoa nibs, of cocoa

beans and/or of roasted cocoa beans with water, said extraction comprising a maceration stage with stirring for a period of 30 min to 1 h 30 min,
- filtration of the nibs and/or the beans,
- recovering of the juice
- evaporation/concentration/drying of the juice.

The name "cocoa taste enhancer" is understood to mean a water-soluble cocoa extract used in combination with a cocoa powder. This cocoa taste enhancer makes it possible to improve the flavor profile of the cocoa in the chocolate drink according to the invention. Indeed, cocoa extracts do not truly reproduce the flavor profile of the cocoa. The cocoa taste enhancer, used in combination with a cocoa powder, makes it possible to approach the flavor profile of the cocoa and to enhance the taste of the chocolate drink.

For some applications, the cocoa taste enhancer according to the invention will be obtained by a process comprising an alkalizing stage during the maceration and/or a roasting stage after drying the juice.

The alkalizing stage makes it possible to modify the color of the cocoa powder and to change the taste to more intense and more powerful flavors. The color of the cocoa powder is darker, with brown or red shades. As the flavor of the taste enhancer is enhanced, it is possible to use a lower quantity of it in the concentrate of the chocolate drink.

The roasting stage is preferably inserted into the process for the manufacture of the cocoa taste enhancer when the latter is obtained from non-roasted cocoa. Indeed, this heat treatment leads to the development of flavor compounds from flavor precursors developed during the fermentation of cocoa nibs: degradation of proteins, caramelization and the like. The consequence

of this stage of the process is to intensify the cocoa flavor and to reduce its bitterness and its pungency.

Consequently, the chocolate drink according to the invention will be preferably prepared from a concentrate containing, in its composition, the cocoa taste enhancer according to the invention.

The invention also relates to the instant chocolate drink concentrates allowing the preparation of the chocolate drink.

Advantageously, these concentrates have a density of 1.15 to 1.45, inclusive, and a viscosity of 1300 to 2900 mPa/s, inclusive. Preferably, said concentrates are in liquid form and additionally contain a cocoa taste enhancer according to the invention.

The cocoa taste enhancer is preferably introduced at a concentration of 1 to 10%, inclusive.

Examples of recipes of concentrates are described in Example 1.

The present invention also relates to the closed capsules of a coffee machine operating by percolation under pressure, containing a concentrate according to the invention. In particular, such capsules have a useful volume of 10 to 40 ml, inclusive, preferably of 20 to 30 ml.

The use of the espresso-type coffee machines operating by percolation under pressure of a coffee dose packaged in a capsule, for the manufacture of a chocolate drink according to the invention, is also within the scope of the invention. More particularly, such machines are characterized in that they deliver a pressure of at least 4×10^5 Pa, preferably at least 5×10^5 Pa.

Other characteristics and advantages of the invention will emerge in the examples which follow.

Example 1: Recipes and data sheets

A. Recipes

The concentrate according to the invention contains at least the following ingredients: sugar and/or glucose syrup, water, low-fat cocoa powder, whole milk powder, a cocoa taste enhancer and flavorings (salts, vanillin).

The low-fat cocoa powder may be completely or partially replaced with natural cocoa powder or preferably alkalized cocoa powder. In addition, the use of "non-low-fat" cocoa powder enhances the smoothness of the final chocolate drink.

The cocoa taste enhancer makes it possible to increase the solubility of the concentrate and to enhance the taste of the chocolate.

Advantageously, the concentrate according to the invention additionally contains vegetable or animal fat other than cocoa butter. These fats, such as copra or milk fat, give the final drink great smoothness, body and mellowness. Their use in the recipe should however be limited so that the high solubility of the concentrate is maintained.

Alternatively, these fats may be completely or partially replaced by other ingredients such as thickeners, gelling agents (cellulose, methylcellulose), stabilizers (carrageenan, alginate, guar, pectin carboxymethylcellulose and the like) and/or modified starches.

Milk derivatives can also completely or partially replace the whole milk powder. In particular, whey provides a better taste intensity and, from the nutritional point of view, it contributes toward

markedly increasing the quantity of minerals present in the drink. The milk material and part of the sugar may also be introduced in the form of condensed milk.

The introduction of emulsifiers such as soybean lecithin makes it possible to enhance the solubility of the concentrate according to the invention.

Recipe table

Sample	Cocoa %	Cocoa taste enhancer %	Vegetable fat %	Whey %	Sugar %	Whole milk %	Other ingredients %	Water %
2*	9	0	5**	2	46	7	+***	30
8	15	0	0	2	43	7	+***	30
12*	12	0	5**	5	40	7	+***	30
17*	12	2	5**	5	38	7	+***	30
18*	12	1	8**	5	36	7	+***	30
19*	12	2	8**	5	35	7	+***	30
20	15	2	0	2	43	7	+***	30
21	15	2	0	2	42	7	potato starch 2% +***	30
22	15	2	0	2	42	7	rice starch 2% +***	30
23	15	2	5**	2	38	7	+***	30

* Use of cocoa powder containing 20/22% fat (non-low-fat cocoa powder). In the other cases, powder containing 10/12% fat is used (low-fat cocoa powder).

** The fat used is copra fat 24/26.

*** The other ingredients are salt and flavorings, in particular vanillin.

B. Process of manufacture

The cold water, the glucose and/or sugar syrup, the whole milk powder and/or the whey are introduced into a jacketed steam cooker under vacuum. The cooking is carried out for 5 to 15 minutes, with a steam of 85 to 90°C, under a vacuum of -0.5 to -0.7 × 10^5 Pa.

The cocoa powder, the cocoa taste enhancer and the vegetable fat are then added to the mixture 1, and then another cooking is carried out at 85/90°C under the same vacuum for 5 to 15 minutes.

The mixture then undergoes a smoothing phase by rapid stirring until a perfectly homogeneous and smooth texture is obtained. The minimum duration of this smoothing phase is about 5 minutes.

The brix of the product is finally checked and then it is packaged in pouches (bag in box) or containers at a temperature of 80 ± 2.5°C.

Physicochemical characteristics

Criteria	Recipes 17 and 20	Methods
Dry matter	67 ± 3 brix	Refractive index measured at 20°C
pH	6.4 ± 0.5	O.I.C.C.* page 9 - E-/1972
Water activity	0.85 max.	Measured with Rotronic
Viscosity	1000-6000 m/Pa.s	Brookfield at 20°C, N6, speed 20
Density	1.27 ± 0.05 kg/l	

Microbiological characteristics

Criteria	Recipes 17 and 20	Methods
Total microbes	5000/g	ISO 4833 (1991)
Yeast	50/g	ISO 7954 (1988)
Mould	50/g	ISO 7954 (1988)
Enterobacteriaceae	10/g	ISO 7402 (1993)
Coliforms	10/g	ISO 4831 (1991)
E. Coli	0/g	ISO 7251 (1994)
Staphylococcus coagulase	0/g	ISO 6888 (1987)

Salmonellae	Abs/750 g	ISO 6579 (1993)

Nutritional information

Criteria	Values: recipe 17	Values: recipe 20
Carbohydrates	46.1%	49.3%
Lipids	9.4%	3.3%
Proteins	5.0%	5.1%
Nutritional values	289 kcal/100 g or 1207 kJ/100 g	247 kcal/100 g or 1036 kJ/100 g

Shipping and storage conditions

Criteria	Values
Transport	< 25°C
Storage	< 25°C
OUBD	At least 12 months from the date of manufacture

Food safety information

Criteria	Values
GMO status	The product does not contain any ingredients obtained from genetically modified organisms.
Heavy metals	In accordance with Codex Alimentarius

Example 2: Solubilization tests - Comparison of the chocolate drinks obtained from capsules containing a concentrate according to the invention or conventional cocoa powder

In a 25 ml capsule, the liquid concentrate is compared with a powdered equivalent.

The experiment is carried out on an espresso coffee machine, under the conditions described below:

Outline and result of the test

	Liquid concentrate	**Powdered chocolate product**
Capsule		
Volume:	25 ml	25 ml
Density of the product in the capsule:	1.27 kg/l	0.650 kg/l
Weight product in the capsule:	30 g	16 g
Concentration product:	70% by weight	100% by weight
Weight dry matter in the capsule:	21 g	16 g
Conditions machine		
Pressure for injection of water:	6×10^5 Pa	6×10^5 Pa
Temperature of the water:	70°C	70°C
Throughput of the machine:		
Time for rise in pressure:	12 s	12 s
Time for passage through the capsule:	33 s	33 s
Quantity of water introduced into the cup:	90 g	99 g (90 + 9)
Recipe before percolation		
Cocoa powder:	14%	14%
Result of the percolation dissolution		
Quantity of dissolution:	100%	<75%
Quantity extracted from the capsule:	21 g	12 g
Quantity produced in the cup:	21/(90 + 9 + 21) that is 17.5%	12/(99 + 12) that is 10.8%
Quantity of cocoa powder in the cup:	2.45%	1.5%

Consequently, in the case of the concentrate and for the same quantity of water in the cup, 63% more cocoa is present in the cup in the case of the concentrate according to the invention compared with the powdered product. This demonstrates the greater solubility of the concentrate.

Example 3: Cocoa taste enhancer

The cocoa taste enhancer may be obtained in two grades:

- a so-called alkalized soluble powder
- a so-called natural soluble powder

The raw material which may be used for the manufacture of the cocoa taste enhancer consists of commercial cocoa nibs, green cocoa beans and/or roasted cocoa beans. Reference will be made to this raw material under the name "bean".

The process is based on a solid/liquid extraction, followed by separation of the phases, concentration and drying.

I. Alkalized soluble powder:

a. Treatment of the bean

The first stage of the process is a liquid/solid extraction. This operation consists of a stage for moistening/alkalizing/macerating the bean in the presence of water. The bean is moistened with a minimum of twice its volume of water. It is preferable, however, to work with a quantity of water equal to 4 or 5 times the volume of the bean.

The alkalizing is carried out with alkaline compounds in a quantity and in a quality defined by European law. Such compounds may be advantageously chosen from alkali

metal carbonates, alkali metal hydroxides, magnesium carbonates, magnesium oxides, ammoniacal solutions, as defined in the directive 73/241/EEC of the Council of July 24, 1973, relating to the harmonization of the legislation of the Member States relating to cocoa and chocolate products intended for human consumption. Preferably, potassium carbonate will be used.

This alkalizing operation may be carried out according to two schemes:

- direct alkalizing on the bean at the beginning of the extraction operation, or
- alkalizing after filtration, or directly on the extracted juice.

The maceration may be carried out with slow stirring for a period which may range from 30 minutes to 3 hours, with a preference for 1 hour to 1 hour 30 minutes. The maceration temperature is advantageously between 50 and 100°C, preferably around 80°C.

The extraction is followed by a filtration stage. This operation consists in separating the solid phase from the liquid phase. It may be advantageously carried out with the aid of a bag filter or a hydro-extractor.

The washing of the bean then makes it possible to recover the maximum extract. Several washes of the bean, carried out with water, may be necessary. Each wash fraction is then recombined with the first extraction juice.

At the end of these different stages, a juice containing the extracted cocoa is obtained. This juice constitutes the base for the cocoa taste enhancer.

b. **Treatment of the extracted juice**

The extracted juice first of all undergoes an evaporation-concentration. This operation consists in removing most of the water. In order to obtain a concentrated syrup, it is necessary to work between 50 and 100°C under reduced pressure.

The concentrated syrup obtained is then dried, according to the alternative drying processes described below:

i. spray-drying in a tower, production of a granulated or non-granulated powder;
ii. drying in a drum dryer: production of a powder in the form of flakes;
iii. oven drying: production of a crystallized mass requiring grinding so as to be converted to a powder.

In the case of drying which is not satisfactory in terms of the organoleptic characteristics, such as roasted taste, additional roasting may be necessary. This is then advantageously carried out with the aid of techniques using hot air. By way of example, such techniques may be chosen from the following techniques: fluidized bed, twin screw heating jacket, double reactor heating jacket, oven, coffee roaster and the like.

II. Natural soluble powder:

The process is identical to the process described above, in its implementation, with the exception of the alkalizing stage, which is omitted.

Example 4: Production of a capsule

Before being packaged in capsules, the concentrate is stored in a 1000 kg container, sealed after filling. The shelf life of the product under these conditions is

at least 12 months, stored at a temperature of less than 25°C. The container valve is also steam-sterilized. The container is emptied with the aid of a pump.

Alternatively, the product may be stored in bags. In this case, the valve must be sterilized, preferably with isopropyl alcohol or another sterilizing solution.

The packaging machine is put in overpressure with sterile air. Likewise, all the equipment is disinfected. The tube connecting the container to the packaging machine is also steam-sterilized (30 min, 120°C).

The capsules used to hold the concentrate according to the invention are made of pure or multilayered materials in order to protect the content of the capsule against the uptake of moisture and against oxidation with atmospheric oxygen. By way of example, there may be mentioned aluminum, a plastic (PP, PE, PA), a composite (board/aluminum/plastic), EVOH, PVDC, PET and the like. Such capsules are described in Patent Application EP 1 190 959.

A. Cold aseptic filling

Because the content of the capsule is a liquid, the capsules are advantageously filled aseptically and at cold temperature.

Before filling, the capsules must be sterilized. Such a sterilization may be carried out, by way of example, with hydrogen peroxide. Next, the capsules are dried with sterile air.

The capsules are then filled with the concentrate according to the invention. The lid is sealed at 200°C in order to bring about the sterilization. The space

between the liquid level and the lid is replaced with a neutral gas, nitrogen for example.

B. Nonaseptic filling

Alternatively, the filling may be carried out nonaseptically. In this case, the product is heated to a temperature of at least 75°C and this temperature is maintained in the capsule for at least 10 minutes. If the product is heated to 85°C, this temperature is maintained in the capsule for at least 15 seconds.

Under these conditions, there is a risk of deviation in the taste and an increase in the viscosity, but it is not necessary to sterilize the capsules.